

# **Rapa Nui Landscapes of Construction Project (LOC11)**

**Work on the *Ara Moai* (northwest and  
south) and at Rano Raraku  
2015**



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## Rapa Nui Landscapes of Construction

The Rapa Nui Landscapes of Construction Project (LOC) is funded by a grant from the Arts and Humanities Research Council in the UK. Based at the Institute of Archaeology, University College London, the project is directed by Sue Hamilton of UCL (principal investigator) and Colin Richards of the University of Manchester (co-investigator), in collaboration with Kate Welham of Bournemouth University (co-investigator). The University of the Highlands and Islands (Project Partner) is represented by Jane Downes.

On the Island, LOC works with Rapanui elders and students and in close cooperation with the *Corporacion Nacional Forestal* (CONAF), Rapa Nui, and the *Museo Antropológico P. Sebastián Englert* (MAPSE).

The main aim of the project is to investigate the construction activities associated with the Island's famous prehistoric statues and architecture as an integrated whole. These construction activities, which include quarrying, moving and setting up of the statues are considered in terms of Island-wide resources, social organisation and ideology.

The Project is not just concerned with reconstructing the past of the island, but is also contributing to the 'living archaeology' of the present-day community, for whom it is an integral part of their identity and their understanding and use of the island. LOC is working with the Rapanui community to provide training and help in recording, investigating and conserving their remarkable archaeological past. Fieldwork between 2008 and 2013 was undertaken under a permit issued by the *Consejo de Monumentos Nacionales*, Chile (ORN No 1699 CARTA 720 DEL 31 del 01.2008).

January/ February 2015

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## Work on the *Ara Moai* (northwest and south) and at Rano Raraku

by Sue Hamilton & Mike Seager Thomas

### 1. Introduction

This report details the results and interim conclusions of work conducted on the *Ara Moai* northwest between Rano Raraku and a point approximately equidistant between it and Maunga Anamarana, and their associated archaeology, on the *Ara Moai* south between Rano Raraku and Ahu Hoa Anga Vaka A Tua Poi, at Puna Pau and at Rano Raraku by the Rapa Nui Landscapes of Construction Project (LOC) in January and February 2015. This work represents a continuation of work conducted on the *Ara Moai* and at Rano Raraku in 2013–14, and at Puna Pau in 2008–9, 2012 and 2013, the rationale behind which is laid out in LOC interim reports 5–10 (LOC 2012a; 2012b; 2013a; 2013b; 2014a; 2014b) and our application to CONAF for 2015 (*Appendix 1*). For Puna Pau, its aim was to reveal surface features related to quarrying activities, including paths into and out of the quarry, quarry zones and spoil heaps; for the *Ara Moai*, to finish surface and geophysical survey work left incomplete at the end of LOC's 2014 season, owing to time constraints and equipment failure, and to provide data against which to test observations made on and conclusions drawn about the southwestern *Ara Moai* and its associated archaeology in 2013 and 2014; and for Rano Raraku, to identify the relative chronologies of the phases of quarrying and, in particular, the position of its petroglyphic eyes in relation to these. In addition, for all four sites, it aimed to provide data useful to CONAF for site management, conservation and presentation, and generally to enhance, better map and put into a wider context already completed fieldwork. The methods used included earth resistivity (*Ara Moai* south), low level aerial photography/ photogrammetry using a quad-copter (*Ara Moai* south, Puna Pau and Rano Raraku), walkover and GPS survey accompanied by detailed prompt-led descriptive survey and photographic survey (*Ara Moai* northwest), and detailed descriptive and photographic survey (Rano Raraku). Work at Rano Raraku was further enhanced by an in depth discussion of the site's petroglyphic eyes on site with Rapa Nui artist and elder Mr Edmundo Pont. LOC's 2015 fieldwork was carried out in consultation with and with the approval of: CAM (*Secretaría Técnica de Patrimonio* Rapa Nui), CONAF, CODEIPA, DGAC (Aeropuerto Mataverí) and MAPSE. (*Appendix 2–3*). It was assisted/ guided in the field by Christopher Ahsoun Tuki, Moana Gorman Edwards, Alejandro Tucki Castro and Christian Veri Veri.

*Note: This report is concerned with work conducted as part of the Rapa Nui Landscapes of Construction Project (LOC). Details of survey work conducted by the LOC team at the request of CONAF and the Secretaría Técnica de Patrimonio Rapa Nui on Poike, at Rano Raraku and at Vaitea are not included.*

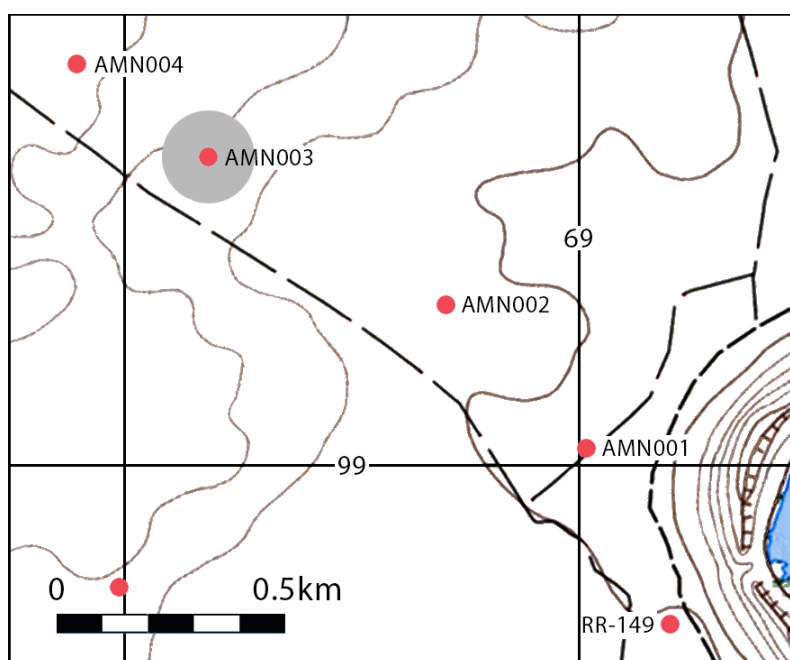
### 2. *Ara Moai* Northwest

#### *Method*

For the survey of the *Ara Moai* south between Rano Raraku and Ahu Hoa Anga Vaka A Tua Poi a transect extending up to 100 m either side of a



modern footpath, which links the *moai* thought to line it, was walked. Within this transect every archaeological feature identified was geolocated using a handheld GPS, assigned a unique feature number and photographed and described on a pre-prepared prompt-led feature record sheet (LOC 2014a, appx 2). Additionally, *moai* were recorded on pre-prepared prompt led Conservation Sheets (LOC 2014a, appx 4) and multiple high resolution photographs were taken from which 3-D models were later created. Weathering on the Fronts of *Moai* Record Sheets (LOC 2014a, appx 5), designed to record similarities or differences in weathering indicative of the position of the *moai* when weathering took place, were also completed. For the survey of the *Ara Moai* northwest, we hoped to duplicate this method, surveying a similar transect either side of a footpath linking the four *moai* lining it, and so generate a record against which our earlier work could be directly compared, and our conclusions tested. Owing to the dense ground vegetation along later and illness in the team, however, a full survey could not be conducted within the time available; and although all four *moai* (AMN1-AMN4) were fully recorded, together with a fifth closer to Rano Raraku (Atlas no. RR-149), which may be, but probably was not part of the same alignment, the survey of associated archaeological features was restricted to a circle 100 m radius around AMN3 (*Figure 1*).

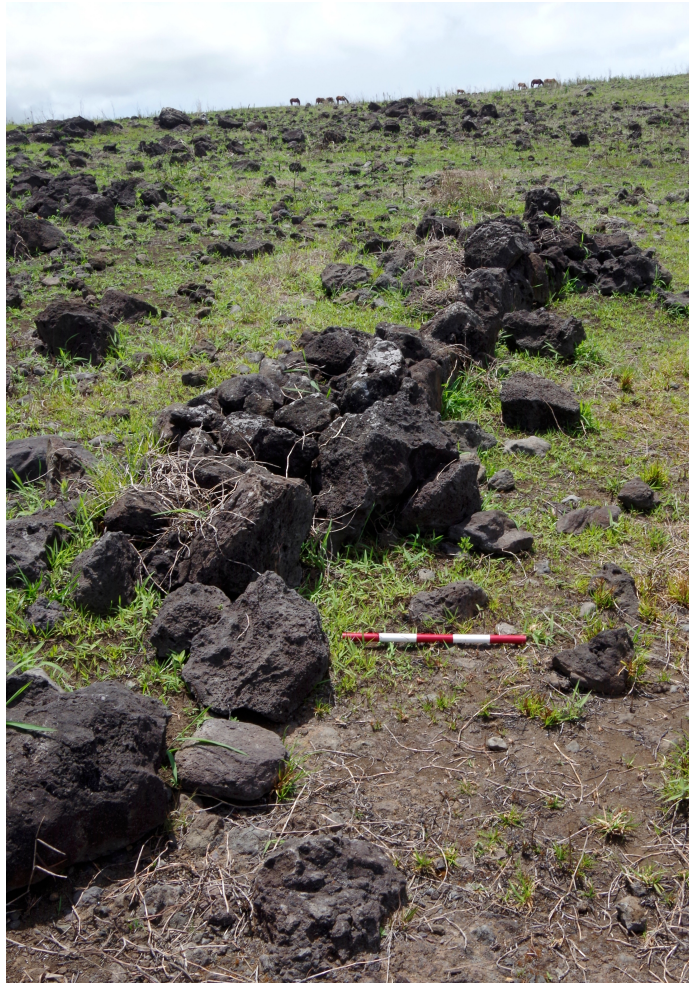


**Figure 1.**  
The Ara Moai north. Red = moai; grey = detailed walkover survey

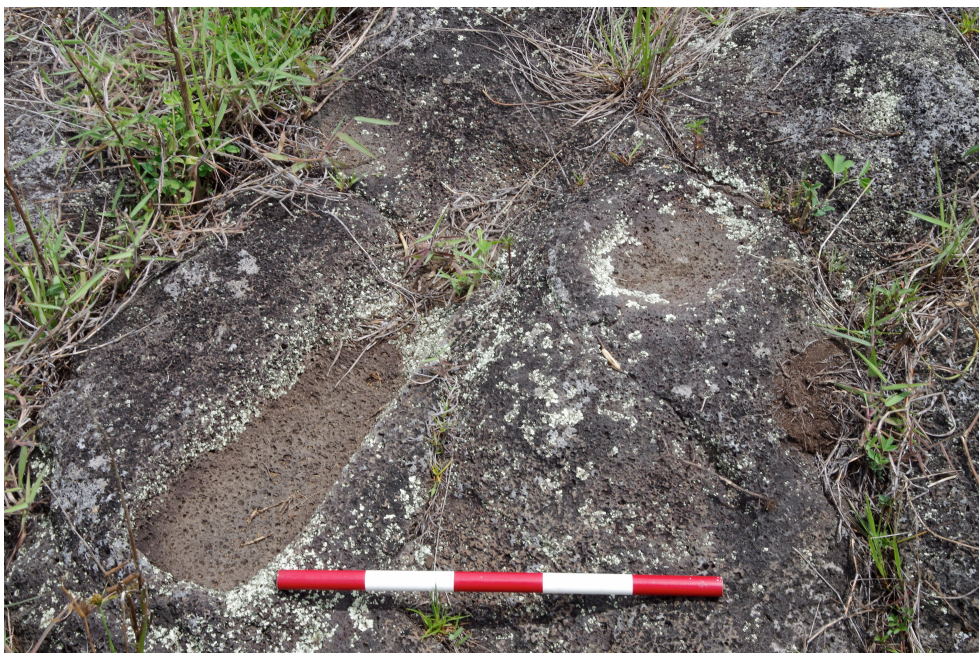
### Results

In all 21 features along the route of the *Ara Moai* northwest were recorded: the four *moai*, and within the circle around AMN3, three probable manavai, some fragments of carved Rano Raraku tuff of uncertain purpose, a partial *umu*, a circular stone structure, seven minor quarries, a wall/ linear stone structure (*Figure 2*), a pile of stones, a *taheta* complex (*Figure 3*) and the end stone or *pini* of a *hare paenga* (*Appendix 4; Digital Appendices 1 & 2*).

Except for a small 'clearing' around AMN3 and a modern track running N-S across it, the surveyed circle was in addition almost completely filled with rock mulch. Owing to dense vegetation, which obscured between 30 and



**Figure 2.**  
*Linear feature/ wall (AMN012)*



**Figure 3.**  
*Taheta complex (AMN016)*





**Figure 4.**  
*Circular stone structure (AMN009)*

40% of the circle, the recorded distribution of features within it is almost certainly incomplete and incompletely representative of the features present, and of their relationships, and for the most part therefore it is of no value for comparative purposes. It is, however, worth noting a direct relationship between a probable manavai and a *moai* (AMN4 and AMN5), the range of features present, and the ubiquity of minor quarrying amongst these, all of which recall the record made for the *Ara Moai* south. Otherwise the only notable observations made were the position of a solid stone structure at the head of a valley (AMN9) (*Figure 4*) and a broken *mata'a* spotted close to AMN 12, fashioned from Motu Iti rather than the usual Orito obsidian (cf. Mulrooney *et al.* 2014) (*Figure 5*).<sup>1</sup>

The *moai*, which like those on the *Ara Moai* south lay on their fronts (AMN1, AMN3 and RR-149) or sides (AMN2), with their heads away from Rano Raraku, or on their backs (AMN4), with their heads towards it, were found to be in a similar variable state of preservation (*Digital Appendix 3 & 4*). All remain vulnerable to the elements and to animal activity, but owing to their locations off the beaten track, and despite the fact that RR-149 had recently been used as a lavatory, are much less vulnerable to people. The Weathering on the Fronts of *Moai* Record survey was only viable on AMN1-AMN3 and RR-149. This too showed trends of weathering similar to that observed on the *Ara Moai* south, with parts of the *moai* that would have been protected had they been standing less weathered than parts that would have been protected, confirming that, like the *moai* on the *Ara Moai* south, the *moai* on the *Ara Moai* northwest had formerly been standing. Any such differences on AMN4, which is lying on its back, have been obliterated by subsequent weathering.

Surveyors: Moana Gorman Edwards, Sue Hamilton & Mike Seager Thomas  
Photography: Mike Seager Thomas & Adam Stanford

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<sup>1</sup> This object was left in situ.



**Figure 5.**  
*Broken mata'a fashioned from Motu Iti obsidian (found close to AMN012)*

### 3. Ara Moai South

Work on the *Ara Moai* south focused on completing the geophysical survey left unfinished in 2013–14 due to equipment failure and a quad-copter photogrammetric survey, although the opportunity was taken to check some data relating to *moai* condition and *moai* position garnered during the 2013 survey.

#### *Geophysics*

Geophysical survey on the *Ara Moai* south in 2013–14 employed magnetic techniques (LOC 2013a; 2014a). In places these were able to identify the 'road' but only where it was clearly visible on the surface. The 2015 survey measured soil resistivity, which it was hoped would detect shallow compacted features that the earlier survey had failed to (LOC 2014a, 42) (*Appendix 5*). It was carried out at five locations, from west to east: AMS211, a lynchet-like feature running up to AMS125 (Cook's *Moai*); AMS171, a hollow way and lynchet-like feature adjacent to an unnamed *ahu* (AMS169); AMS144, a linear hollow bisecting a complex of features at Tuta'e, including a large rectangular *poro* pavement, a *hare paenga* and a *manavai* complex (AMS137); AMS114, the *moai* at the foot of Maunga Toa Toa (*Figure 6*); and AMS113, the next *moai* east. At AMS125, AMS221 was shown to continue up to the *moai*, and was much clearer than it was in the plots produced using magnetic techniques. Both it and AMS171 were shown to be wider than the modern track. None of the other surveys showed linear anomalies but that around AMS114 showed an anomaly at the base of the *moai* identified using the same technique in 2009 (LOC 2012a, fig. 5.12), and identified as a platform, but also a number of similar anomalies in the vicinity. These observations suggest, on the one hand, that the extant road continues beyond what is easily visible on the surface, and on the other, that the platform identified in 2009 remains open interpretation as geological. Up to a point survey was compromised by surface and near surface rock



— particularly at Tuta'e, but some instances produced clearer results than magnetic techniques and was able to see evidence for the *Ara Moai* both when it is associated with a clearly visible topographic feature, *and* when it is not. It is therefore concluded that earth resistance survey has the potential to be effective in tracing the *Ara Moai*.



**Figure 6.**  
*Resistivity survey at the base of AMS114*

#### *Aerial photography*

The aim of the photogrammetric survey of the *Ara Moai* south was the provision of data for detailed mapping and for presentation purposes, in particular the exact (visible) extent things like the rock mulch and manavai complexes, which are difficult to plan on the ground. The whole of the *Ara Moai* between Rano Raraku and Ahu Hoa Anga Vaka A Tua Poi was overflowed and a good set of overlapping photographs obtained..

Surveyors: Charlene Steele, Christian Veri Veri & Kate Welham

Photography: Adam Stanford

Flight assistant: Moana Gorman Edwards

#### **4. Puna Pau**

Work at Puna Pau was restricted to a flyover by the quad-copter. The aim of this work was the generation of a 3-D model, which would reveal surface features related to quarrying activities that are not visible on the ground. Good presentation quality aerial photos were obtained, but no new features revealed, probably owing to the height and irregularity of the vegetation within and outside the crater.

Photography: Adam Stanford

Flight assistant: Moana Gorman Edwards

## 5. Rano Raraku

### *Surface survey*

During our 2013–14 survey of eye petroglyphs at Rano Raraku, it became clear to us that in some cases the pattern of tool marks and various other features related to *moai* extraction (e.g. LOC 2014b, figs 6 & 7) could be used to assess both the numbers of *moai* extracted from each bay and the order in which they were removed. We also noted how the visibility of petroglyphs varied depending on the type of day. In this final year of the survey, we hoped to record both some of these relative chronologies and the position of the eyes in relation to these, and, by conducting our work at a different time of day, to find more eyes. Attention focused on the exterior bay in which eyes E09–12 and E15 are located, and the inner quarry, in particular the bay in which eyes I07–8 are located. (Work was also conducted in the exterior bay in which eyes E01 and E02 are located but the evidence here was too ambiguous to make much sense of in terms of removal sequences and the relationship between these and the extant eyes).



**Figure 7.**

*Evidence for moai removal in front of eyes E09–E12. The surface of a natural fissure quarried back to facilitate the removal of a moai carved up against it. As elsewhere in the quarry, the worked area is demarcated by a white silica encrustation*

For our analysis of the exterior bay, we have assumed that those eyes that are out of reach from the current base of the quarry, were within reach from the base of the quarry when they were carved. Below and in front of eyes E09 and E10 (we now believe E11 might be a misidentification), there is evidence for at least four *moai* removals and space for more (Figure 7). The third and fourth of these are directly associated with eyes, and would have necessitated the destruction of any eyes associated with the second and possibly the first. E09 was cut with a blunter *toki* than the tool marks around it. E12 is associated with evidence for at least three *moai* removals. One of these, if of a very large *moai*, could be the same as the first from in front of



the locations of E09 and E10. E12 would have been carved after the first but before the last of these three removals. E15, which overlooks two in situ *moai*, is associated with the last of at least two *moai* removals. No surviving eyes are associated with the preceding removal. The inner quarry bay in which I07 and I08 is located shows evidence for perhaps two possible *moai* removals. Both I07 and I08, which is close to the modern landsurface, should relate to the second of these.

No new eye petroglyphs were identified but E09 and I08, previously identified as single eyes, were shown to be pairs of eyes. In both cases the new evidence was the same: a partial outline of the eye, too faint to distinguish clearly in imperfect lighting conditions, and, where the rest of the eye would have been located, a heavily weathered quarry face from which all traces of working — including tool marks — had been lost. To the left of, and approximately level with E09, a row of cup marks that had not previously been identified, was recorded (LOC no. A14) (*Figure 8*).



**Figure 8.**  
*Cup marks close to Rano Raraku's eye E09*

#### *Discussion with Edmundo Pont*

Mr Pont was shown eye petroglyphs I01 and I02, I05 and I07 and I08. Mr Pont associates different quarries — Orito, Puna Pau, Rua Toki Toki, Rano Raraku — with different families. Quarries and quarry tools are *tapu*, he said, and hence the abandonment of the latter on site. Eyes, like the eyes comprising Maki Maki facemasks, come in pairs, and accordingly he questioned our identification of individual eyes as such, likening one of those comprising I05 to a *komari*. In this context, he also questioned any conceptual link between *moai* eyes and petroglyphic eyes, the shapes of which he insisted are quite different, and rejected the idea that the petroglyphic eyes were the eyes of Rano Raraku itself. He suggested instead that the unambiguous pairs of eyes, which he accepted as such, are not Make Make but represent individual spirits or *varva*, each of which guards, and

warns people away from the location of a particular extraction,<sup>2</sup> an observation he contrasted with the many spirits sometimes associated, for example, with individual caves. Mr Pont was questioned about why some bays have petroglyphic eyes and others do not. He had no explanation for this but pointed out that the eyes, the *varva*, were not necessary until those working the bay left, the implication being that bays without eyes — assuming these later had not been destroyed — were not wilfully abandoned.

#### *Aerial photography*

The aim of the aerial photography was twofold. Firstly we wished using low level photography to better record and characterize individual bays in which eyes had been identified, and secondly, using higher level photography, to produce a photogrammetric plan onto which we could accurately plot the eyes and other features identified by us during surface survey, existing photographic coverage of the site being of insufficient resolution for this purpose (see LOC 2014b, appx 1). Owing to adverse weather conditions the first was not possible. However, all of the relevant parts of the quarry were overflown at a higher level and a good set of overlapping photographs obtained from which a photogrammetric plan is currently being constructed.

#### *Provisional interpretation*

Mr Pont's interpretation goes beyond ours, but, except in relation to the site's single eyes (some of which are all that survive of a former pair) and our initial linking of lenticular petroglyphic eyes to *moai* eyes (LOC 2014b, 7), it does not diverge greatly from it. Our earlier work had already recognized an association between *moai* removal and petroglyphic eyes (LOC 2014, 22) and this is supported by both this year's fieldwork and Mr Pont's identification of individual pairs of eyes, and individual *varva*, with individual extractions. Further work noted below (section 6) suggests that this relationship may be peculiar to special quarries, and not quarrying generally.

Surveyors: Moana Gorman Edwards, Sue Hamilton & Mike Seager Thomas

Photography: Mike Seager Thomas & Adam Stanford

Flight assistant: Moana Gorman Edwards

## 6. Ongoing work

The work outlined above marks the end of LOC's survey work on the Island. UK based work related to the project as a whole, however, is on-going. This includes the digital processing of the aerial photographic record, the collation and digital processing of parts of the written record, the processing of samples and the illustration of finds, sections and plans from Puna Pau, and the final write-up (and translation) of the project (Table 1). Except for the final write up and its translation, all of this is scheduled to be completed this year.

#### *The Ara Moai*

Apart from its final write up, the only outstanding work related to the *Ara Moai* is the processing and drawing up of its photogrammetry. Processing is

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<sup>2</sup> Similar views were volunteered independently by Rapanui archaeologist Sonia Haoa Cardinali.



scheduled for completion next month (May 2015). Drawing/ mapping will begin soon after.

#### *Puna Pau*

The final obsidian hydration dates for Puna Pau were delivered in March (*Appendix 6*). Finds drawing is underway. The photogrammetry is due in May. Agreements are in place to process the pollen (from R. Scaife of the University of Southampton) and the micromorphological samples (from C. French of the University of Cambridge) and the samples will be delivered before July 2015.

#### *Rano Raraku*

Apart from the final write up, outstanding work by LOC on Rano Raraku includes the processing of the photogrammetry, due to be completed in July 2015, the preparation of maps from this, scheduled for the following month, and the collation of data — from the literature (e.g. McCoy 2014) and our own work (LOC 2012a, chapter 3; 2013a; 2014; etc.) — on the association of eye petroglyphs with quarrying.

## 7. Conclusion

As stated in LOCs application to *CONAF* for 2015 (*Appendix 1*), the aims of the work described above were to enhance and put in a wider context fieldwork completed by us in 2013–14, to complete work left unfinished in 2013–14 and to provide further data for *CONAF* useful for site management, conservation and presentation. Work was inhibited by illness and the ground conditions in some of the survey areas, and as a result it was not possible to fulfill all these aims. Nonetheless much was achieved, of use both to us and to *CONAF*. On the *Ara Moai* north good comparative data for our *moai* surveys on the *Ara Moai* south were obtained, on the strength of which we are now able to state with confidence that our observations on, and interpretation of, *moai* weathering on the latter are not peculiar to it. We also noted a feature suite and a number of feature relationships that the two *Ara Moai* share in common, though we were unable to undertake a full survey of these. For Rano Raraku, we confirmed a possible relationship between petroglyphic eyes and *moai* removal, obtained data from which it should be possible to produce a more detailed map than is currently available, and, with Mr Pont's help, expanded our interpretative horizons in relation to Rapanui quarrying. We also completed the geophysical survey of the *Ara Moai* south, and now have a full set of data with which to characterize it, and which shows the relative usefulness in the Rapa Nui landscape of the different techniques employed. The importance of this work is three-fold. For LOC it lies firmly within the context of our overall research design and the work already carried out by us, the conclusion of which it marks. For *CONAF* it compliments the data already delivered to it by us. For the Rapanui and the wider archaeological community, it provides new data and ideas upon which to develop their understanding of the Island's archaeological landscape and build future research. The role of the project now is to process the outstanding data and samples, to integrate the results of this with those of the work already completed, and to write up our final conclusions. It is our belief that both our data and our conclusions will provide a useful resource for the Rapanui, *CONAF* and the wider archaeological community over time.

## Acknowledgments

The team would particularly like to thank all our friends at Rano Raraku, Edmundo Pont, and Merahí Atan López of the *Secretaría Técnica de Patrimonio* Rapa Nui for their help on the Island this year.

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## Appendix 1. Application to CONAF for 2015 (English)



### **SOLICITUD DE INVESTIGACIÓN ARQUEOLÓGICA EN EL SISTEMA NACIONAL DE AREAS SILVESTRES PROTEGIDAS DEL ESTADO.**

#### 1. Antecedentes del investigador:

1. NOMBRE DEL INVESTIGADOR RESPONSABLE (adjuntar C.V, certificado de título, certificados que acrediten la pertenencia a una institución científica o universidad): <ul style="list-style-type: none"><li>• Professor Sue Hamilton</li></ul>
2. INSTITUCIÓN CIENTÍFICA O UNIVERSITARIA A LA CUAL PERTENECE: University College London, Institute of Archaeology
3. GRADO ACADÉMICO DEL INVESTIGADOR RESPONSABLE: Professor of Prehistory, University College London, UK BA (Hons) 1976 – University of London, UK PhD 1993 – University of London, UK
4. PASAPORTE O CEDULA DE IDENTIDAD: British Passport. Number: 650454460
5. DIRECCIÓN , TELEFONO EN ISLA DE PASCUA. Mana Nui Inn, Hanga Roa, Rapa Nui Phone-Fax (56-32) 2100811
6. CORREO ELECTRÓNICO s.hamilton@ucl.ac.uk
7. NOMBRE DE LOS INVESTIGADORES ASOCIADOS, GRADOS ACADÉMICOS. (Indicar contraparte 10-12chilena de ser una investigación extranjera, indicar calificación profesional, responsabilidad y pertenencia a instituciones de investigación o universidades): <ul style="list-style-type: none"><li>• Professor Colin Richards, Professor of World Prehistory, University of Manchester, UK</li><li>• Professor Kate Welham, Associate Professor of archaeological science, Bournemouth University, UK</li><li>• Francisco Torres H. arqueologo professional, Curador colecciones arqueologicas, Museo Antropologico P. Sebastian Englert (MAPSE)</li></ul>
8. INDICAR N° DE PERSONAL DE APOYO SIN FORMACIÓN EN ARQUEOLOGÍA. None

## 2. Antecedentes del proyecto:

1. NOMBRE DEL PROYECTO: Rapa Nui Landscapes of Construction Project (LOC)
2. NOMBRE DE LA INSTITUCIÓN PATROCINANTE (En caso de ser extranjero presentar convenio con institución científica nacional que patrocina): <ul style="list-style-type: none"> <li>University College London Institute of Archaeology</li> <li>MAPSE</li> </ul>
3. DIRECCION, TELEFONO Y CORREO ELECTRÓNICO DE INSTITUCION PATROCINANTE: University College London Institute of Archaeology 31-34 Gordon Square, London, WC1H 0PY, UK Telephone: +44 (0) 20 7679 7483
4. NOMBRE, CARGO y CORREO ELECTRÓNICO DE RESPONSABLE DE LA INSTITUCIÓN PATROCINANTE: Prof. Sue Hamilton, Director, University College London Institute of Archaeology Email: <a href="mailto:ioa-director@ucl.ac.uk">ioa-director@ucl.ac.uk</a>
5. NOMBRE DEL SITIO A ESTUDIAR. <ul style="list-style-type: none"> <li>Rano Raraku</li> <li>Ara Moai (Rano Raraku–Ahu Hoa Anga Vaka A Tua Poi</li> <li>Ara Moai (north) 669012/6990270-667490/7000409</li> <li>Puna Pau</li> </ul> Offer of work for CONAF while our equipment is on the island: e.g. Ahu Ura Uranga, Te Pitu Kura, Tepeu, Vaihu complex or of other sites of interest to CONAF (e.g. Poike)
6. INDICAR SUPERFICIE TOTAL A INVESTIGAR, <ul style="list-style-type: none"> <li>Rano Raraku c. 100 X 100 m</li> <li>Ara Moai c. 1km x 100m</li> <li>Puna Pau c. 100m x 100m</li> </ul>
7. RESUMEN DEL PROYECTO: The aim of the project is a re-examination of the construction of monuments on Rapa Nui. This involves characterising the quarrying, transportation and construction of monuments as an inter-related and social process. The research framework to be adopted is primarily a 'landscape perspective' and is based on an investigation of the spatial representation, landscape position and organization of the quarries, paths of movement and the position of other selected sites. The assumption lying behind this research project is that the sculpting, quarrying, transportation and erection of the <i>moai</i> and <i>pukao</i> played a major role in the organization and reproduction of social relationships in prehistoric Rapa Nui. And that the selection of different 'places' in the landscape for different stages of the construction process were not purely chosen for technological reasons but related more to the meanings and characteristics attached to particular places across the island. The majority of outstanding fieldwork involves scientific recording and descriptive, interpretative landscape survey. This will provide high resolution information for CONAF to aid the interpretation, presentation conservation management of the Rapa Nui landscape and specifically the Ara Moai, Puna Pau and Rano Raraku



8. TIPO DE INTERVENCIÓN: Registro o intervención (Prospección, excavación o aplicación de otras herramientas). En caso de ser excavación debe presentar el permiso de CMN e indicar % del sitio a intervenir. Low level aerial photography and photogrammetry, GPS mapping and descriptive surface survey, sub-surface geophysical survey
9. FORMULACION GENERAL DEL PROYECTO: Landscape survey
10. HIPOTESIS <ul style="list-style-type: none"> <li>• Rano Raraku. The petroglyphic eyes surveyed relate to specific contexts and stages of quarrying</li> <li>• Ara Moai. The area of and around the moai roads or alignments were integrated with a wide range of domestics, industrial, agricultural and ritual activities over time. The weathering of moai shows that the moai along the Ara Moai were once standing</li> <li>• Puna Pau. Puna Pau quarry was repeatedly remodelled as result of quarrying activities.</li> </ul>
11. OBJETIVO GENERAL To enhance and put in a wider context completed fieldwork and provide further data for CONAF useful for site management, conservation and presentation, and to complete work left unfinished in previous seasons
12. OBJETIVOS ESPECIFICOS DE LA INVESTIGACIÓN: <ul style="list-style-type: none"> <li>• Rano Raraku. To identify the relative chronologies of the phases of quarrying and the position of the eyes in relation to these. Provision of data useful to CONAF in managing, conserving and presenting the quarry.</li> <li>• Ara Moai south (geophysics). To identify near surface features related to the Ara Moai.</li> <li>• Ara Moai northwest (conservation and weathering surveys). Provision of data useful to CONAF in managing and conserving the moai. Identification of weathering profiles indicative of the moai's former position (upright or recumbent)</li> <li>• Ara Moai northwest (surface survey). To identify and map features associated with the Ara Moai. Provision of data useful to CONAF in managing, conserving and presenting the archaeological landscape in the vicinity of the Ara Moai.</li> <li>• Ara Moai south (aerial survey and photogrammetry). Provision of data for detailed mapping and for presentation purposes. (It will record the exact (visible) extent things like the extent of rock mulch and manavai complexes, which are difficult to plan on the ground).</li> <li>• Puna Pau. To reveal surface features related to quarrying activities, including paths into and out of the quarry, quarry zones and spoil heaps. Provision of data useful to CONAF in presenting the quarry.</li> </ul> <p>Offer of work for CONAF at Ahu Ura Uranga, Te Pitu Kura, Tepeu, Vaihu complex or of other sites of interest to CONAF (e.g. Poike) while our equipment is on the island. Provision of data for detailed mapping and for presentation purposes. (It will record the exact (visible) extent of the features surveyed, and which are difficult to plan on the ground).</p>
13. METODOLOGIA <ul style="list-style-type: none"> <li>• Rano Raraku. Detailed descriptive and photographic survey of selected quarry zones containing eye petroglyphs; low-level aerial photography and photogrammetry of selected quarry zones using quad-copter</li> </ul>

- Ara Moai south (Rano Raraku–Ahu Hoa Anga Vaka A Tua Poi): earth resistivity; low-level aerial photography and photogrammetry of selected quarry zones using quad-copter
- Ara Moai north: conservation survey of moai; GPS and descriptive survey of associated features
- Puna Pau: low-level aerial photography and photogrammetry of the interior of the crater using quad-copter

Offer of survey/recording work for CONAF at Ahu Ura Uranga, Te Pitu Kura, Tepeu, and the Vaihu complex or of other sites of interest to CONAF while our equipment is on the island: low-level aerial photography and photogrammetry using quad-copters (Phantom & Inspire 1)

14. PLAN DE TRABAJO DE LAS ACTIVIDADES A DESARROLLAR EN PNRN (adjuntar carta gantt):

	Rano Raraku	Puna Pau	Ara Moai south	Ara Moai north	CONAF requests
11					
12					
13					
14				S	
15				S	
16		A		S	
17					
18					
19	S, A		G		
20	S, A		G		
21	S		G		
22	S		G, A		
23	S		G, A		
24					
25					
26				S	A
27				S	A
28				S	A
29					S, A
30					S, A
31					
1					

G=geophysics

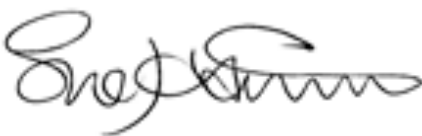
S=surface/ GPS/ conservation survey

A=aerial photography/ photogrammetry

15. IMPORTANCIA DEL PROYECTO PARA LA DISCIPLINA:

The generation of new data on the form and relationships of Rapa Nui's surface and sub-surface archaeology relevant to the full and proper understanding of the Island's prehistory. The project focuses on processes of construction, the contexts of monumental construction and the daily use of the landscape, and the inter-relationship of these. Our fieldwork is unique in its use of a wide range of technologies and methods. It provides unique perspectives on Rapa Nui prehistory that allow Rapa Nui's archaeology and its interpretation to be managed and presented on a landscape scale, beyond current foci on a limited number of well-known and much studied sites.

In addition, this has the potential to raise the profile of Rapa Nui's archaeology and Rapa Nui as a tourist destination and encourage tourists to reside on the island for longer periods.

<p>16. FECHAS DE INICIO Y TERMINO DE LAS ACTIVIDADES. 15th–30th January 2015</p>
<p>17. FECHAS ENTREGA INFORME PRELIMINAR E INVENTARIO: English: 15<sup>th</sup> April 2015 Spanish: 1<sup>st</sup> May 2015</p> <p>18. INFORME PARCIALES: English: 15<sup>th</sup> April 2015 Spanish: 1<sup>st</sup> May 2015</p> <p>19. INFORME Y/O PUBLICACIÓN FINAL: September 2017 (project book). Some articles based upon selected final results can be expected in 2016</p>
<p>20. OTROS PERMISOS REQUERIDOS (ESPECIFICAR): DGAC Mataveri Airport (To be advised?)</p>
<p>21. APOYO SOLICITADO A CONAF (ESPECIFICAR) Rano Raraku: CONAF ranger as guide</p>
<p>22. EL INVESTIGADOR PRINCIPAL QUE SUSCRIBE , INDIVIDUALIZADO EN LOS PUNTOS 1 Y 2 SE COMPROMETE POR EL PRESENTE INSTRUMENTO A:</p> <p>23. CUMPLIR LAS NORMAS GENERALES Y REQUISITOS ESTABLECIDOS EN EL REGLAMENTO DE INVESTIGACIONES EN EL SISTEMA NACIONAL DE AREAS SILVESTRES PROTEGIDAS DEL ESTADO, QUE EXPRESAMENTE DECLARA CONOCER.</p> <p>24. CUMPLIR CON LOS ARTICULOS DE LAS LEYES 17.288, 19.300 Y 19.253 QUE GUARDEN RELACION CON LA NATURALEZA DE SU INVESTIGACIÓN PARTICULAR.</p> <p>25. RESPETAR LOS DERECHOS DE LAS COMUNIDADES INDÍGENAS INDICADOS EN LA LEY 19.253 Y CONVENIO 169 SOBRE PATRIMONIO DE LAS ETNIAS ORIGINARIAS.</p> <p>26. EL INVESTIGADOR DECLARA QUE LOS DATOS VERTIDOS EN LA PRESENTE SOLICITUD SON FIEL EXPRESIÓN DE LA VERDAD.</p>
<div style="text-align: center;">  </div> <hr style="width: 20%; margin: 10px auto;"/> <div style="text-align: center;"> <p>FIRMA DEL INVESTIGADOR PRINCIPAL</p> </div> <div style="margin-top: 20px;"> <p>FECHA: 11<sup>th</sup> January 2015</p> </div>

1. QUIEN SUSCRIBE SE COMPROMETE A LA ENTREGA DE AL MENOS 2 COPIAS DEL TRABAJO REALIZADO EN EL PARQUE NACIONAL RAPANUI, LAS QUE DEBERÁN ENVIARSE A:

- SECRETARIA DE COMUNICACIONES (SECOM) EN AVENIDA BULNES 197 2° PISO – SANTIAGO.
- OFICINA PROVINCIAL DE CONAF EN ISLA DE PASCUA, CASILLA 18 – ISLA DE PASCUA.

\_\_\_\_\_  
FIRMA DEL JEFE DE LA INSTITUCION PATROCINANTE

FECHA: 

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## Appendix 2. Permission to work from CODEIPA 2015

### CARTA AUTORIZACIÓN

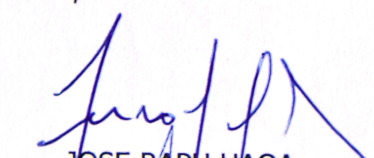
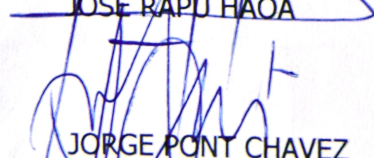
Los abajo firmantes, obrando bajo el ejercicio de sus atribuciones autorizan al equipo de trabajo arqueológico de Sue Hamilton, a fin que para la mejor de las labores de prospección arqueológica dentro del territorio insular, puedan hacer uso de elementos tales como un vehículo aéreo no tripulado, para fin de poder hacer las respectivas filmaciones aéreas en apoyo a su trabajo en sectores determinados e informados previamente por la CAMN, dentro de tres lugares, comprendidos como "ARA O TE MOAI", "RANO RARAKU" y "PUNA PAU", bajo la supervisión de quien suscribe y la participación de un experto local, y en un periodo determinado entre el 26 y el 30 de enero de 2015 y bajo el siguiente cronograma:


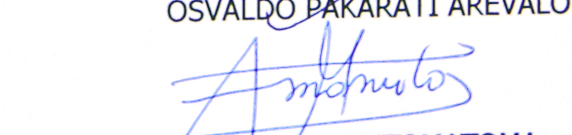
- 1.- Rano Raraku: 5 días de prospección y fotografías aéreas.
- 2.- Puna Pau: 2 fotografías aéreas.
- 3.- Ara Moai Sur: 5 prospecciones y fotografía aérea
- 4.- Ara Moai Norte: 2 a 3 prospecciones y fotografía aérea.

Asimismo, la CET de Desarrollo de CODEIPA certifica que la solicitud presentada por el equipo de trabajo de Sue Hamilton, ha sido vista y discutida en las respectivas sesiones de comisión acordándose la autorización ya indicada en sesión de fecha 23 de enero de 2015.

Las facultades de la CODEIPA a este respecto se encuentran en el artículo 67 de la ley 19253.

Saluda a Ud. Atentamente Comisionados Electo Rapa Nui de CODEIPA.

  
JOSE RAPI HAOA  
  
JORGE PONT CHAVEZ

  
OSVALDO PAKARATI AREVALO  
  
ANAKENA MANUTOMATOMA

MARIO TUKI HEY

Isla de Pascua, 23 de enero de 2015.



## Appendix 3. Permission to work from DGAC 2015



DIRECCION GENERAL DE AERONAUTICA CIVIL  
DEPARTAMENTO DE AERODROMOS Y SERVICIOS AERONAUTICOS  
SECCION SERVICIOS DE VUELO

SANTIAGO, 27 DE ENERO DEL 2014

### RADIOGRAMA

GG SCSCZXOO SCMDYXYC SCELZRZR SCIPZPZX SCIPZTX SCIPYDYX

#### SCSCYTYX

**RDO NR 09/1/2027.** SE AUTORIZA A LA EMPRESA ADAM STANDFORD-AERIAL CAM LTDA. PARA EFECTUAR VUELOS DE SISTEMA AÉREO NO TRIPULADO (RPAS) EN LA REGION DE VALPARAISO (ISLA DE PASCUA) DE ACUERDO A LA AUTORIZACION DEL SUBDEPTO. DE OPERACIONES DE LA D.S.O. Y AL CUMPLIMIENTO DE LAS OBSERVACIONES DE LA PRESENTE AUTORIZACION.

<u>EMPRESA EJECUTORA</u>	ADAM STANDFORD-AERIAL CAM LTDA.
<u>BASE OPERACIONES</u>	ISLA DE PASCUA
<u>AERONAVE(S)</u>	SISTEMA AÉREO NO TRIPULADO (RPAS)
<u>OPERADORES</u>	ADAM STANDFORD-AERIAL CAM LTDA EMAIL: <a href="mailto:adam@aerial-cam.co.uk">adam@aerial-cam.co.uk</a> CONTACTO SR. FRANCISCO TORRES HOCHSTETTER FONO 56-32 2551020 / 2551021
<u>FECHA DE OPERACIÓN</u>	26 DE ENERO AL 06 DE FEBRERO DE 2015
<u>HORARIO</u>	10:00 Y LAS 01:00 UTC
<u>LIMITE VERTICAL</u>	400 FT
<u>LUGAR OPERACIÓN</u>	LAT 27° 05' 40.87" S / LONG 109° 14' 25.62" W 27° 07' 16.01" S / 109° 17' 27.97" W 27° 07' 05.39" S / 109° 17' 30.21" W 27° 07' 19.08" S / 109° 17' 42.95" W 27° 08' 58.65" S / 109° 24' 11.94" W
<u>OBJETO OPERACIÓN</u>	TRABAJO DE FOTOGRAMETRIA AEREA EN SITIOS ARQUEOLOGICOS DE ISLA DE PASCUA. ENCARGADO POR EL MUSEO ANTROPOLOGICO SEBASTIAN ENGLERT DEPENDIENTE DE LA DIRECCION DE BIBLIOTECAS, ARCHIVOS Y MUSEOS.

#### OBSERVACIONES :

SE PROHIBE REALIZAR SOBREVUELOS EN AREAS POBLADAS.

EL OPERADOR DEBERA ANTES DEL INICIO DE SUS ACTIVIDADES TOMAR CONTACTO CON EL JEFE DE LOS SERVICIOS DE TRANSITO AEREO DEL AEROPUERTO MATAVERI DE ISLA DE PASCUA SR. GEORGE POBLETE AL TELÉFONO 32 2100246 PARA COORDINAR, SOLICITAR INFORMACIONES E INSTRUCCIONES POR RESTRICCIONES DE TRÁFICO AÉREO. POSTERIORMENTE DEBERA INFORMAR EL TÉRMINO DE SUS OPERACIONES AL NÚMERO TELEFÓNICO INDICADO ANTERIORMENTE.

DGAC / DASA - AV. SN PABLO N° 8381, PUDAHUEL, STGO. - TEL (2) 290 47 04 - (2) 290 46 66 - [trabajo.aereo@dgac.cl](mailto:trabajo.aereo@dgac.cl)



**DIRECCION GENERAL DE AERONAUTICA CIVIL**  
**DEPARTAMENTO DE AERODROMOS Y SERVICIOS AERONAUTICOS**  
**SECCION SERVICIOS DE VUELO**

EL OPERADOR SERA RESPONSABLE DE QUE QUIEN LLEVE LOS CONTROLES DE VUELO DEL APARATO SEA UNA PERSONA CAPACITADA Y CON EL ENTRENAMIENTO ADECUADO PARA UNA OPERACIÓN SEGURA

EL OPERADOR SERA RESPONSABLE DE QUE LAS CONDICIONES DE AERONAVEGABILIDAD DEL APARATO GARANTICEN QUE LA OPERACIÓN NO SE VERA AFECTADA POR SITUACIONES DE MANTENIMIENTO YA SEA MECANICO O ELECTRONICO, O DE OTRO TIPO.

SE ASEGURARA QUE ANTE LA PERDIDA PARCIAL DE CONTROL DEL RPAS, O ANTE UNA EVENTUAL FALLA DE LOS SISTEMAS, ESTE PUEDA SER DIRIGIDO HACIA UN LUGAR LIBRE DE PERSONAS, VEHICULOS Y/O BIENES INMUEBLES HABITADOS

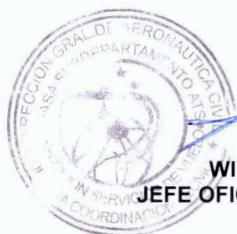
ESTA PROHIBIDO SOBREVOLAR AREAS CONGESTIONADAS DE CIUDADES, PUEBLOS, LUGARES HABITADOS O SOBRE UNA REUNION DE PERSONAS AL AIRE LIBRE.

ANTE LA PRESENCIA DE ALGUNA AERONAVE TRIPULADA EN LAS CERCANIAS, DEBERA CANCELAR LA OPERACIÓN.

LA TRAYECTORIA DE ASCENSO Y DESCENSO SE DEBERA REALIZAR SOBRE UN AREA DESPEJADA HASTA ALCANZAR LA ALTITUD Y EL LUGAR DONDE SE REALIZARAN LAS FOTOGRAFIAS AEREAS Y ADOPTARA EL MISMO PROCEDIMIENTO AL ATERRIZAR.

SE SOLICITA A LA ARO DEL AEROPUERTO MATAVERI EMITIR NOTAM SI CORRESPONDE.

SALUDA A UD.



**WINSTON GARRIDO OLIVARI**  
**JEFE OFICINA DE COORDINACIÓN TÉCNICA**

#### Appendix 4. *Ara Moai* North Survey Feature List (LOC survey nos AMN1–AMN22)

Feature no.	Feature type	Other numbers	Easting	Northing
AMN001	<i>moai</i>	Atlas 13–431	669013	6999018
AMN002	<i>moai</i>	Atlas 13–413	668702	6999340
AMN003	<i>moai</i>	Hunt 1055 Shepardson Road–NW–12	668184	6999673
AMN004	<i>moai</i>	Shepardson Road–NW–10	667901	6999878
AMN005	<i>manavai</i> (possible)	unknown	no reading	no reading
AMN006	<i>moai</i> tuff carving	Shepardson Road–NW–11	667991	6999673
AMN007	<i>manavai</i> (possible)	unknown	668190	6999731
AMN008	<i>umu</i>	unknown	668240	6999692
AMN009	circular stone structure	unknown	668268	6999706
AMN010	minor quarry	none	668233	6999667
AMN011	minor quarry	none	668278	6999633
AMN012	linear structure/ wall	unknown	668267	6999642
			668264	6999653
AMN013	minor quarry	none	668272	6999650
AMN014	<i>manavai</i> (possible)	unknown	668236	6999635
AMN015	minor quarry	none	668214	6999622
AMN016	<i>taheta</i> complex	unknown	668196	6999549
AMN017	minor quarry	none	668196	6999549
AMN018	minor quarry	none	668138	6999566
AMN019	<i>pu paenga (pini)</i>	none	668096	6999770
AMN020	minor quarry	none	668107	6999680
AMN021	pile of stones	unknown	668107	6999680



## Appendix 5. Resistivity Survey on the *Ara Moai* South, 2015

by Kate Welham & Charlene Steele

### *Introduction*

The '*Ara Moai*', or *moai* roads, are a network of tracks that originate from a common centre at Rano Raraku and spread out over the island towards the coastal ahu locations. Recumbent *moai* lie at intervals along them. Records from Routledge (1919), and excavations by Heyerdahl (1989) and Love (2001) have indicated that these 'roads' may be tracks at best and are likely to be shallow ephemeral features, possibly containing some compacted areas of soil. Many of the statues along the *Ara Moai* have been found to have sub-circular pads of stones near their base, on which they once would have stood (LOC 2012a; Heyerdahl 1989; Love 2001; Richards *et al.* 2011). Mapping using satellite imagery techniques (Hunt 2005) has provided suggested locations for the network of *Ara Moai* across the island.

This geophysical survey builds on the work commissioned in 2013 and 2014 by CONAF to investigate the *Ara Moai* south between Rano Raraku and AMS 125 (Cook's *moai*) (LOC 2013b; 2014a) in advance of the creation of a heritage trail. The work forms part of a larger Level 1 survey of the *Ara Moai* area, where the aim has been to determine if geophysical survey can identify evidence for the presence of the *Ara Moai* in areas where it is not easily visible on the ground. Magnetic geophysical techniques (using a fluxgate magnetometer and an electroconductivity meter) were assessed in 2013 and 2014 (LOC 2013a, chapter 7; 2014a, appx 3). The aim for the 2015 season is to assess the responses from electrical resistance survey.

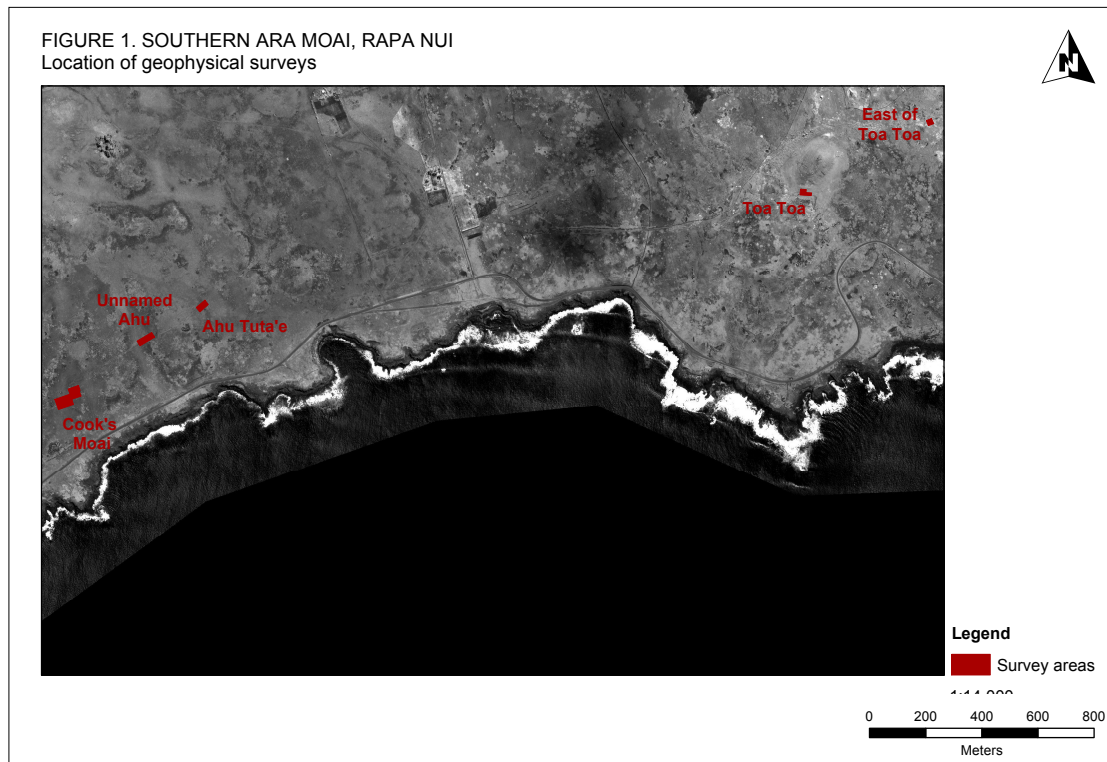
### *Method*

Earth resistance survey was conducted at five locations along the southern *Ara Moai* (*Figure A5.1*). Grids for geophysical survey were located using a Leica 500 differential Global Positioning System (dGPS) and data were downloaded and processed in Leica GeoOffice v.8.0, and converted to SIRGAS2000. Plans were produced in ESRI ArcGIS v10.0 using point data exported from Leica Geo Office, and base map layers provided by CONAF. Locations of all 2015 survey areas are presented in *Figure A5.1*.

Earth resistance survey was conducted using a Geoscan RM15-D resistance meter and a PA5 multi probe array frame in the 0.5 m configuration. Readings were taken at 1 m intervals along traverses spaced 1 m apart. All grids were 20 m by 20 m. All data were subjected to minimal processing (e.g. despiking, edge match and clip) in Archeosurveyor v2.5, and imported into ArcGIS v10.0 for display and production of interpretation plots. The data are presented in *Figures A5.2–6* in which white represents areas of low resistance and black areas of high resistance.

### *Results*

The results of the 2015 earth resistance survey will be discussed with direct reference to the data obtained from the magnetic surveys in 2013 and 2014 (LOC 2013a, chapter 7; 2014a, appx 3). It is worthy of note that the areas covered by all of these surveys contain frequent outcrops of basalt bedrock, and the presence of large quantities of basalt stones and rocks on the ground surface is common. The depth of soil coverage by site is also highly variable. It is thought likely that in areas where the soil cover is thin, the presence of shallow subterranean rock has been detrimental to the quality of earth resistance probe contact achieved.



**Figure A5.1.**  
*Location map of earth resistance survey*

#### AMS 125 Cook's *moai*

This site was originally selected due to the presence of a visible depression and corresponding track on a slope to the southwest of Cook's *moai*. The track/ putative *Ara Moai* appears to run northeast — southwest towards Cook's *moai*, where it can no longer be seen. The results of the electromagnetic (magnetic susceptibility data only) and fluxgate magnetometer survey indicated that there was a linear anomaly clearly visible that mirrored the track running towards Cook's *moai*. The results from the earth resistance survey are extremely clear here, and show a low resistance linear anomaly that runs along the same route up to the *moai* itself ([Figure A5.2](#)). This anomaly is *c.* 6–8 m wide and is particularly distinct on the northern edge. It mirrors the observations made about the width of the *ara* at this point made by Love (2001) when he excavated in this area.

To the east of the *moai*, the earth resistance data are less clear, but probably indicate that the road continues in a straight line under the *moai* and then onwards towards the top north-east corner of the survey as a weak low resistance area ([Figure A5.2](#)). Here the earth resistance data have provided more clarity than seen in the magnetic data sets in which the response around the *moai* was thought likely to be a response to a modern track (LOC 2014a, fig. A3.2). These data would then correspond with the continuing very weak, linear anomaly observed in the extended magnetic susceptibility and fluxgate magnetometry data of this area. The position of this magnetic anomaly is in line with the course of the *Ara Moai* where it can be seen on a slope to the northeast as a hollow way (LOC 2014a, fig. A3.2).

It is worthy of note that the area directly around the *moai* was excavated by both Love (2001) and Patricia Vargas (results unpublished), and that the latter noted they considered the *moai* to be lying on the road surface

(LOC 2012a, chapter 5). This observation appears to concur with the results of the earth resistance survey.

#### AMS 169 Un-named Ahu

Geophysical survey was carried out in this area due to the presence of a well defined part of the *Ara Moai* adjacent to an un-named *ahu*, immediately north of the survey area. This area was excavated by Love (2001) in 2000 where he noted deep deposits relating to the *Ara Moai* (from photographs these appear to be ~1 m deep). The *Ara Moai* could clearly be seen in all three magnetic data sets as a linear anomaly running northeast-southwest across the survey area.

The earth resistance survey data clearly indicate the presence of the *ara*, again as a low resistance anomaly that is of similar width to that seen at Cook's *moai* (Figure A5.3). The remains of Love's trenches appear as a number of linear anomalies running approximately north-west to south-east across the survey area. Towards the north-east end of the survey the linear anomaly becomes obscured, possibly due to the presence of Love's excavations.

#### AMS 137 'Ahu' Tuta'e

Survey was conducted in this area due to the presence of a complex of features including an *ahu*, *hare paenga*, a so-called 'dancing platform' (C. Cristino pers. comm.) and a section of the *Ara Moai* with kerbing. The *Ara Moai* can clearly be seen running from the un-named *ahu* to the southwest and past 'Ahu' Tuta'e before it disappears approximately 20 m to the northeast. There is a supine *moai* in an adjacent field to the northeast.

The *Ara Moai* was not detected in the data from either magnetic survey technique. This area was found to have a stronger magnetic background signal than when compared to the area around Cook's *moai* and the un-named *ahu*. The results from the earth resistance survey were also poor in this area. It is hard to discern any real evidence for the presence of an *Ara Moai* in the results (Figure A5.4). In many places there appears only to be a very thin layer of soil present, the bedrock is very close to the surface and the survey was impacted by the presence of basalt rocks. It is likely that these difficulties impeded the effectiveness of both surveys (LOC 2014a, fig. A3.4).

#### Toa Toa

The survey area at Maunga Toa Toa, was situated immediately surrounding the recumbent *moai* at the bottom of the hill (AMS114). The location of the *Ara Moai* at this point has been under question as mapping by Lipo and Hunt (2005) indicated transit via the north of Toa Toa, although there are no statues in this area. The presence of a recumbent *moai* (AMS114/ Hunt 961) to the south of Toa Toa has provided the suggestion that the *Ara Moai* may run in an alternative direction. There are no visible tracks present on the modern ground surface to the south of the hill.

The presence of a build up of soil from the hill wash from Toa Toa was thought likely to have occurred over time, and therefore the depth of any deposits is unknown. Neither the magnetic survey conducted in 2013 or the earth resistance survey (Figure A5.5) provide a definitive result for the presence of an *Ara Moai* here, and the sub-linear area of low conductivity that runs west to east above the statue was thought likely to be related to the shallow changes in geology in this area (LOC 2013a, figs 25 & 26).

It is interesting to note that the stone pad identified behind the *moai* by previous earth resistivity survey (LOC 2012a, chapter 5) can be seen clearly, particularly in the conductivity data from 2013 (LOC 2013a, chapter 7).

#### *East of Toa Toa*

A small area around the recumbent *moai* to the east of Toa Toa (AMS113) was surveyed, as there is a short line of possible kerb stones, potentially associated with the *Ara Moai*. The magnetic data indicated a sub-linear area of low conductivity and high magnetic susceptibility data which ran from west to east to the north of the statue. The small survey area, and ephemeral nature of the anomaly meant that it was difficult to ascertain whether this is a product of anthropogenic origin (LOC 2013a, fig. 27).

A circular pad of stones, approximately 1 m to the south-east of the base of the *moai*, was clearly visible on the ground surface. This can be seen as a low conductivity anomaly in the same location with the survey area, and may reflect the presence of a pad of stones behind the *moai* as per LOC 2012a, chapter 5.

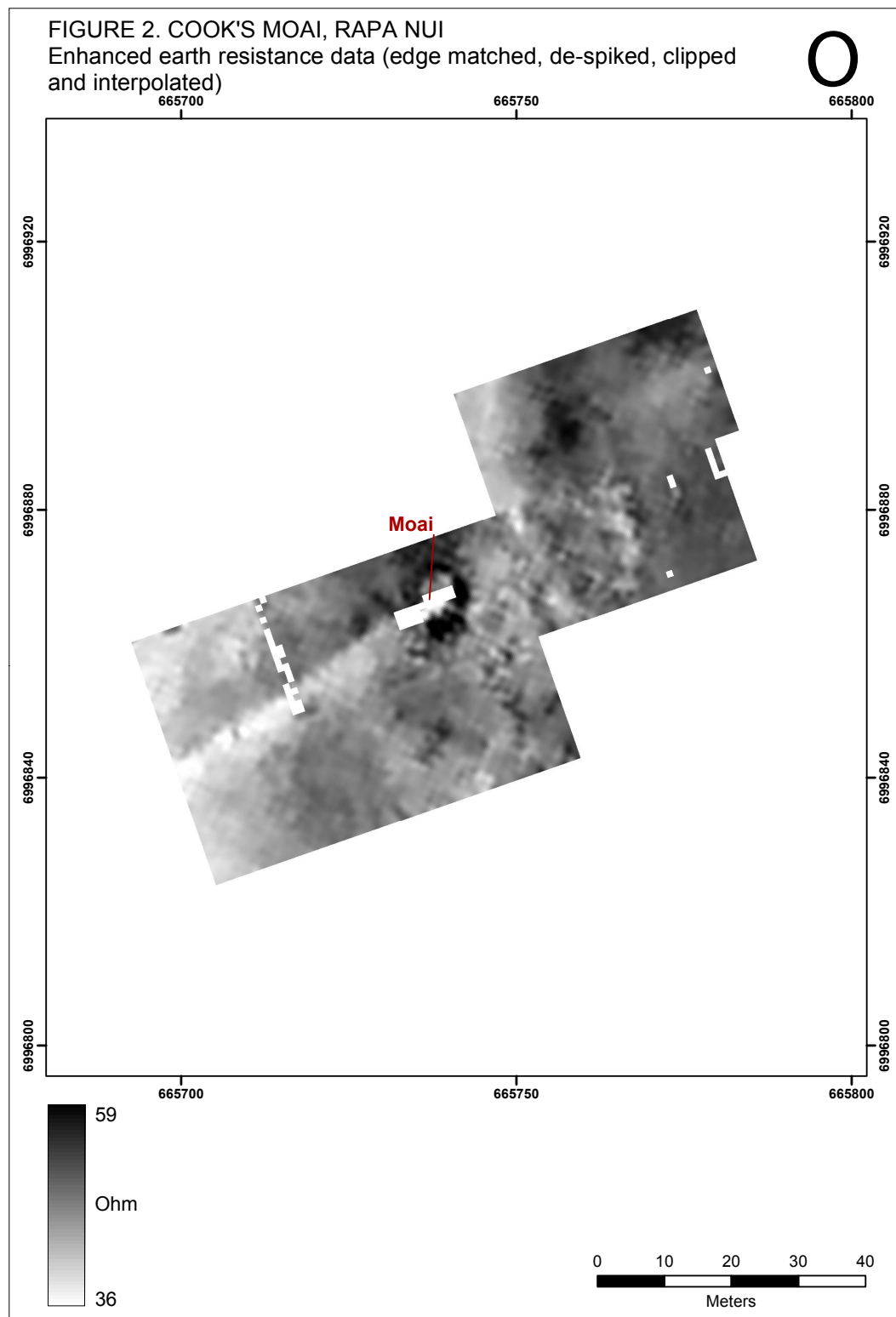
The presence of heavy vegetation around this *moai* in 2015 meant that the earth resistance survey could not be directly comparable with the previous magnetic survey. However, it was possible to survey one grid immediately to the west of the *moai*. Unfortunately the results from the earth resistance survey are inconclusive in this area (*Figure A5.6*).

#### *Conclusion and Further Work*

The results from the earth resistance survey have demonstrated that in a number of areas the *Ara Moai* can effectively be identified using this technique. In contrast to the magnetic data sets (LOC 2013a, chapter 7; 2014a, appx 3), it is possible to see evidence for the *Ara Moai* in the earth resistance data both when it is associated with a visible topographic feature, *and* when it is not visible to the naked eye on the ground.

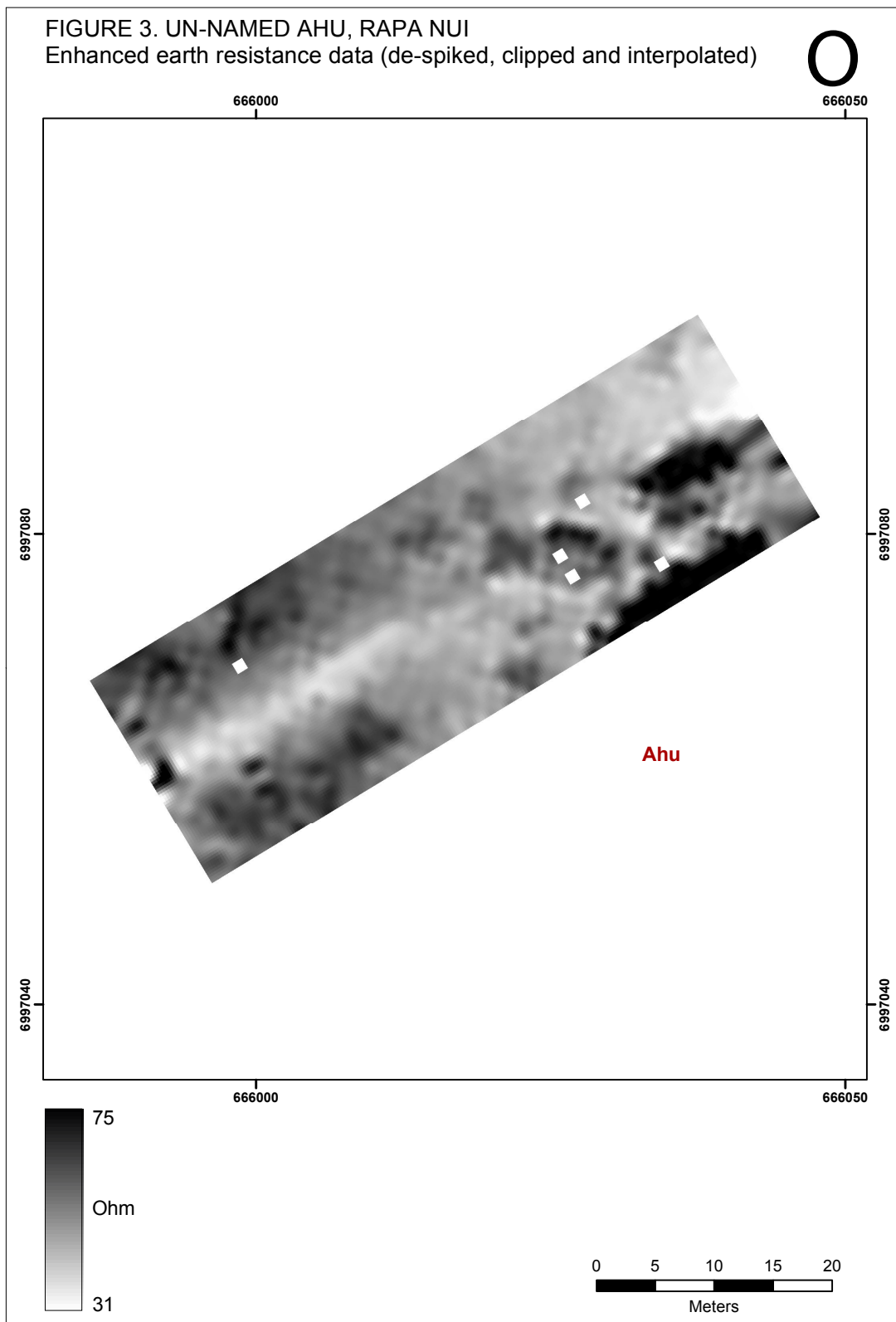
It is therefore concluded that earth resistance survey has the potential to be effective in tracing the *Ara Moai*, but this is most likely only when the sub-soil has some depth to it (as at Cook's *moai*). It is thought that the nature of the *Ara Moai* is likely to be extremely ephemeral, and in many places only consist of a compacted ground surface (Heyerdahl 1989; Love 2001). This type of ground surface when protected by the presence of soil above may act to hold in more moisture, and therefore be the reason for the low resistance response observed in the data. It is worthy of note that due to the nature of the mode of measurement, the effectiveness of the use of the earth resistivity technique would possibly be enhanced by using it during, or immediately after the wetter seasons on Rapa Nui.

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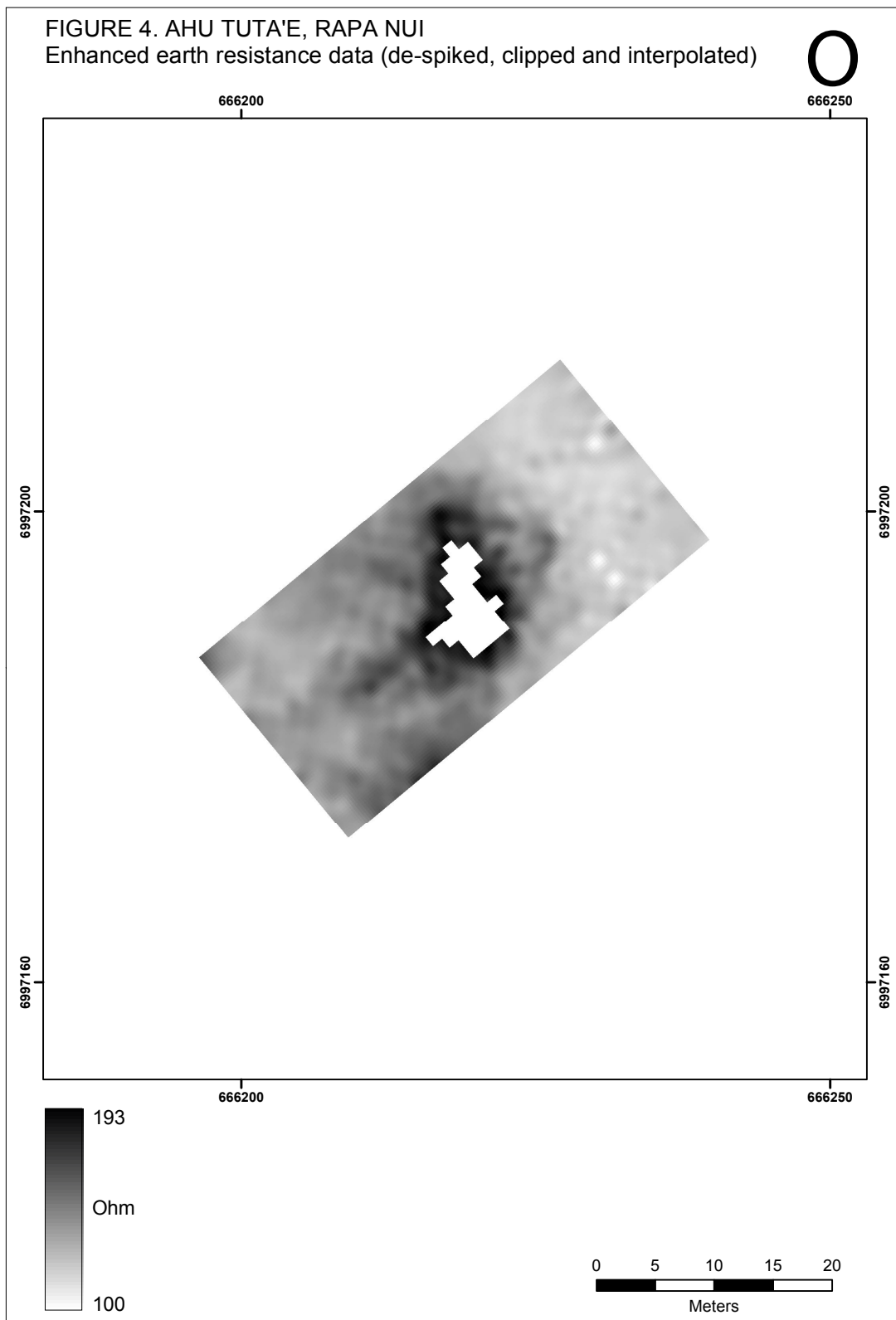


**Figure A5.2.**  
*Results of earth resistance survey at Cook's Moai (AMS125), enhanced data*

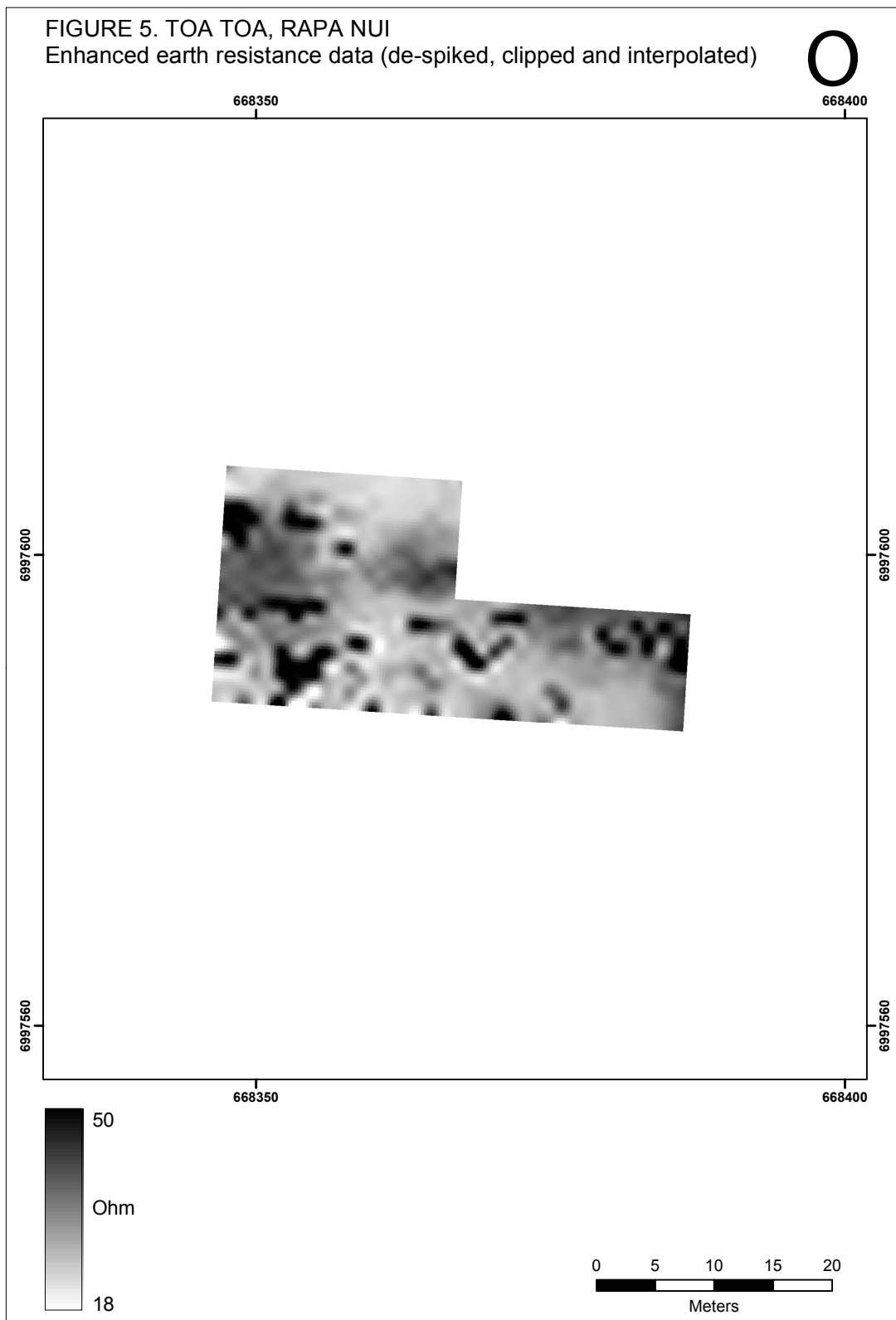




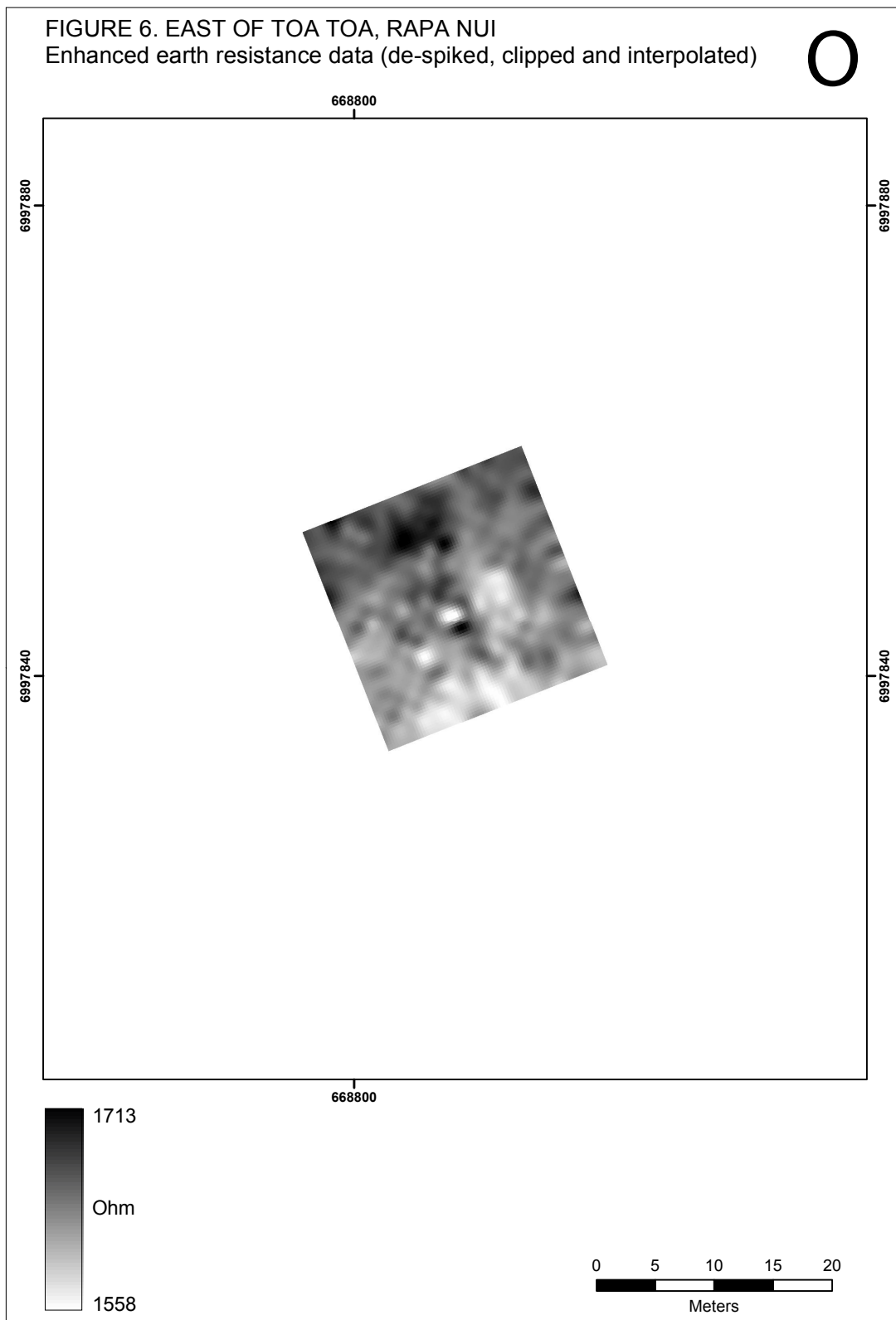
**Figure A5.3.**  
*Results of earth resistance survey at Un-named ahu (AMS169), enhanced data*



**Figure A5.4.**  
*Results of earth resistance survey at 'Ahu' Tuta'e (AMS137), enhanced data*



**Figure A5.5.**  
*Results of earth resistance survey at Toa Toa (AMS114), enhanced data.*



**Figure A5.6.**  
*Results of earth resistance survey at east of Toa Toa (AMS113), enhanced data*

## Appendix 6. Puna Pau (22PP12 & 13) Obsidian Hydration Dates

OHD sample no	Locus		PAS Hydrated 1630 cm <sup>-1</sup>	Hydrated %H <sub>2</sub> O <sub>me</sub>	PAS Hydrated 3570 cm <sup>-1</sup>	Total (hydrated & structural) %H <sub>2</sub> O <sub>t</sub>	3570-1630cm <sup>-1</sup> Structural %OH	40cm deep Adjusted EHT °C	Soil %RH/100	90°C H <sub>2</sub> O <sub>me</sub> <sup>2</sup> /Day	E J/mol <sup>-1</sup>	Ambient %H <sub>2</sub> O <sub>me</sub> <sup>2</sup> /Year Arch RATE	Date BP	Date AD	SD
	trench	context													
1	2	2005(F)	0.2143	0.06	0.5093	0.19	0.12	22.65	0.98	0.00014	83764	0.000091821	500	1509	30
2	2	2005(E)	Rejected by LOC												
3	2	2006(F)	0.1972	0.05	0.3712	0.12	0.07	22.65	0.98	0.00012	84938	0.000070000	556	1453	30
4	2	2007	0.2215	0.07	0.5436	0.20	0.13	22.65	0.98	0.00015	83512	0.000097346	504	1505	30
5	2	2009	0.2080	0.06	0.5064	0.18	0.13	22.65	0.98	0.00014	83656	0.000094156	459	1550	30
6	2	2011	Flaw												
7	2	2014(E)	0.2123	0.06	0.5979	0.23	0.17	22.65	0.98	0.00017	82622	0.000119584	377	1632	30
8	2	2016(G)	0.2100	0.06	0.5359	0.20	0.14	22.65	0.98	0.00015	83345	0.000101184	436	1573	30
9	2	2010	0.2234	0.07	0.5204	0.19	0.12	22.65	0.98	0.00014	83838	0.000090275	553	1456	30
10	2	2020(B)	Flaw												
11	2	2021(D)	0.2143	0.06	0.5037	0.18	0.12	22.65	0.98	0.00014	83831	0.000090409	508	1501	30
12	2	2023	0.1962	0.04	0.4131	0.14	0.09	22.65	0.98	0.00013	84462	0.000078150	493	1516	30
13	2	2024	0.2071	0.05	0.5300	0.20	0.14	22.65	0.98	0.00015	83351	0.000101043	424	1585	30
14	2	2051	Rejected by LOC												
15	3	2084	Flaw												
16	2	2058	0.1958	0.04	0.4352	0.15	0.11	22.65	0.98	0.00013	84206	0.000082911	462	1547	30
17	2	2058	0.2022	0.05	0.4197	0.14	0.09	22.65	0.98	0.00013	84525	0.000077013	531	1478	30
18	2	2058	0.2010	0.05	0.4679	0.16	0.12	22.65	0.98	0.00014	83950	0.000087961	459	1550	30
19	2	2014/2051	Flaw												
Subtraction Method Dates by Christopher Stevenson (Virginia Commonwealth University, Richmond, VA, USA)															



## Appendix 7: Participants

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